BILLING C

DEPARTMENT OF COMMERCE

Bureau of Industry and Security

15 CFR Parts 740 and 774

[Docket No. 210910-0182]

RIN 0694-AI58

Clarifications of Availability and Expansion of Restrictions on Availability of License Exception Strategic Trade Authorization under the Export Administration Regulations

AGENCY: Bureau of Industry and Security, Commerce.

ACTION: Proposed rule.

SUMMARY: In this rule, the Bureau of Industry and Security (BIS) proposes to amend the Export Administration Regulations (EAR) to clarify and expand restrictions on the availability of License Exception Strategic Trade Authorization (License Exception STA or STA) for the export, reexport and transfer (in-country) of certain items controlled under the EAR. Specifically, BIS proposes to clarify the "Special Conditions for STA" paragraph in certain Category 9 Export Control Classification Numbers (ECCNs) on the Commerce Control List to refer exporters to the limitations set forth in the EAR. Also, continuing its efforts to improve export controls and refine License Exception STA, BIS proposes to further restrict the availability of License Exception STA for certain technology controlled under ECCNs 2E003.f and 1E001. This rule also proposes related conforming amendments in License Exception STA and in affected ECCNs.

DATES: Comments must be received by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit comments through either of the following:

• Federal eRulemaking Portal: *https://www.regulations.gov*. The identification number for this rulemaking is BIS– 2020–0023. All filers using the portal should use the name of the person or entity submitting comments as the name of their files, in accordance with the instructions below. Persons or entities submitting business confidential information should clearly identify the business confidential portion at the time of submission, file a statement justifying nondisclosure and referring to the specific legal authority claimed, and provide a non-confidential version of the submission. For comments submitted electronically containing business confidential information, the file name of the business confidential version should begin with the characters ''BC.'' Any page containing business confidential information must be clearly marked ''BUSINESS CONFIDENTIAL'' on the top of that page. The corresponding non-confidential version of those comments must be clearly marked ''PUBLIC.'' The file name of the non-confidential version should begin with the character ''P.'' The ''BC'' and ''P'' should be followed by the name of the person or entity submitting the comments or rebuttal comments. Any submissions with file names that do not begin with a ''BC'' or ''P'' will be assumed to be public and will be made publicly available through *https://www.regulations.gov*.

• Address: By mail or delivery to Regulatory Policy Division, Bureau of Industry and Security, U.S. Department of Commerce, Room 2099B, 14th Street and Pennsylvania Avenue NW, Washington, DC 20230. Refer to RIN 0694–AI58. If you seek to submit business confidential information, you must use the portal. BIS does not accept confidential business information by mail or delivery.

FOR FURTHER INFORMATION CONTACT: Michael Rithmire, Director, Sensors and Aviation Division, Office of National Security and Technology Transfer Controls, Bureau of Industry and Security, by phone at (202) 482-6105 or by email at Michael.Rithmire@bis.doc.gov.

SUPPLEMENTARY INFORMATION:

Background

In a final rule published on June 16, 2011 (76 FR 35276) (June 16 rule), BIS established License Exception Strategic Trade Authorization (License Exception STA or STA) in part 740 (License Exceptions) of the Export Administration Regulations (EAR), as part of the initial effort to reform and modernize U.S. export controls. License Exception STA is set forth in § 740.20 of the EAR and authorizes exports, reexports, and transfers (in-country) of certain specified items to STA-eligible destinations, including the release of certain software source code and technology, as well as certain "600 series" items. There are two groups of STA-eligible destinations: 37 destinations that are included in "Country Group A:5" and are eligible under § 740.20(c)(1), and eight destinations included in "Country Group A:6" and eligible under § 740.20(c)(2). These country group listings appear in Supplement No. 1 to Part 740 (Country Groups). The destinations in these two country groups pose low risk that those items will be used for a purpose that BIS license requirements are designed to prevent. The requirements and conditions for use of License Exception STA include the creation and exchange by the parties to the transaction of notifications and statements designed to provide assurance against diversion of such items to other destinations.

Section 740.20(b) of the EAR sets forth various prohibitions and limitations on the use of License Exception STA, including in § 740.20(b)(2)(viii), which prohibits use of STA, regardless of destination, for certain Category 9 export control classification numbers (ECCNs). Certain software and technology controlled under ECCNs 9D001, 9D002, 9D004, 9E001, 9E002, and 9E003 are among the Category 9 items to which this prohibition applies. However, as a result of text adopted in the June 16 rule in response to certain public comments, the "Special Conditions for STA" paragraphs of these Category 9 ECCNs are not as comprehensive as § 740.20(b)(2)(viii), which potentially confuses exporters. More specifically,

these paragraphs state that STA eligibility for certain software and technology controlled under the ECCNs is excluded to destinations in Country Group A:6, while the controlling text of § 740.20(b)(2)(viii) excludes STA eligibility for these items regardless of destination. In this rule, BIS proposes to clarify the "Special Conditions for STA" paragraphs included under ECCNs 9D001, 9D002, 9D004, 9E001, 9E002 and 9E003 in order to reduce the possibility of confusion. The clarified text, which does not change license requirements or restrictions, would direct exporters, reexporters, and in-country transferors to the Category 9 limitations on the use of STA set forth in § 740.20(b)(2)(viii), when determining STA availability for the export, reexport and in-country transfer of certain items controlled under those ECCNs.

The June 16 rule informed the public that BIS would undertake further review regarding whether technology controlled under ECCN 2E003.f related to the application of certain coatings is, in whole or in part, appropriate for exclusion from License Exception STA. *See* 76 FR 35276, 35278 (6/16/2011). ECCN 2E003.f controls technology for the application of inorganic overlay coatings or inorganic surface modification coatings to non-electronic substrates by certain coating processes. The coating processes specified in this ECCN are critical to the performance of gas turbine engine hot section parts, but are also used for other manufacturing processes, such as optics. The operating environment of engine hot section parts and components is above the actual melting point of the base alloy used to cast these parts; however, the alloy does not melt due to three key technologies: casting (controlled in ECCN 9E003), cooling (controlled in ECCNs 9E001 and 9E003), and coatings (controlled in ECCNs 2E003.f and 9E003). While hot section technologies (controlled for Significant Items (SI) reasons) require a license for export to destinations worldwide (except Canada) and are not eligible for export under license exceptions, coating technologies controlled in ECCN 2E003.f are not controlled for SI reasons and are currently eligible for export to destinations in Country Group A:5 under License Exception STA. Recognizing that the scope of 2E003.f coating technology includes technology with sensitive

industrial applications, this proposed rule would expand restrictions on the use of License Exception STA for ECCN 2E003.f technology, when the technology is used for the application of inorganic overlay coatings on gas turbine engine combustors, or turbine blades, vanes or "tip shrouds" by adding a new restriction in paragraph (b)(2)(ix) of § 740.20.

During this review of coating technology, inconsistencies were also identified in the eligibility of License Exceptions STA and Technology and Software Under Restriction (TSR) (see: § 740.6 of the EAR) for "development" and "production" technology in ECCN 1E001 that has applications in the "development" and "production" of hot section gas turbine parts and components as well as advanced military composite structures. The Special Conditions for STA paragraph in ECCN 1E001 currently prohibits the use of License Exception STA to ship or transmit "technology" for the "development" or "production" of equipment and materials specified by ECCNs 1A002, 1C001, 1C007.c or .d, 1C010.c or .d to any of the destinations listed in Country Group A:6. Some of the technology for which License Exception STA may not be used, however, is eligible for export under License Exception TSR not just to destinations in Country Group A:6, but to a broader universe of destinations in Country Group B.

In addition, current STA eligibility with regard to Country Group A:6 destinations for 1E001 technology with applications in hot section gas turbine parts is inconsistent with § 740.20(b)(2)(viii)'s prohibition on the use of STA with regard to all destinations for hot section technology in Category 9. Moreover, the exclusions from License Exceptions STA and TSR in ECCN 1E001 do not list ECCN 1E001 technology related to materials in Category 1 that are critical to the "development" or "production" of advanced composite aircraft structures — specifically, "development" or "production" technology for high temperature resins controlled under ECCNs 1C008 or 1C009 and fibers or fibers pre-impregnated with a resin (prepregs) controlled in ECCNs 1C007 or 1C010.

This rule proposes to exclude License Exception STA eligibility to all destinations for technology described by ECCN 1E001 for the "development" or "production" of equipment and

materials specified by ECCNs 1A002, 1C001, 1C007.c, 1C008.a.1, 1C009.b, and 1C010.b, .c or .d. This rule also proposes to correct the inconsistencies between License Exceptions STA and TSR and to exclude these same technologies from eligibility for License Exception TSR.

BIS also proposes to make conforming amendments throughout License Exception STA § 740.20(b) and in affected ECCNs.

BIS seeks public comments on the amendments to the EAR proposed in this rule.

Export Control Reform Act of 2018

On August 13, 2018, the President signed into law the John S. McCain National Defense Authorization Act for Fiscal Year 2019, which included the Export Control Reform Act of 2018 (ECRA), 50 U.S.C. 4801–4852. ECRA provides the legal basis for BIS's principal authorities and serves as the authority under which BIS issues this rule.

Rulemaking Requirements

1. Executive Orders 13563 and 12866 direct agencies to assess all costs and benefits of available regulatory alternatives and, if regulation is necessary, to select regulatory approaches that maximize net benefits (including potential economic, environmental, public health, and safety effects, and other advantages; distributive impacts; and equity). Executive Order 13563 emphasizes the importance of quantifying both costs and benefits, of reducing costs, of harmonizing rules, and of promoting flexibility. This proposed rule has been designated a "significant regulatory action," although not economically significant, under section 3(f) of Executive Order 12866.

2. This rule does not contain policies with federalism implications as that term is defined in Executive Order 13132.

3. Notwithstanding any other provision of law, no person is required to respond to, nor may a person be made subject to a penalty for failure to comply, with a collection of information subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.) (PRA), unless that collection of information displays a currently valid Office of Management and Budget (OMB) Control Number. This regulation involves collections previously approved by OMB under control number 0694–0088, Simplified Network Application Processing System, which includes, among other things, license applications and carries a burden estimate of 42.5 minutes for a manual or electronic submission.

BIS expects the total burden hours associated with this collection to increase if this proposed rule is adopted in final form, because the proposal limits availability of License Exception STA. Transactions no longer eligible for this license exception will require licenses. Trying to estimate the number of licenses is difficult because exports of intangible technology are not reported as Electronic Export Information, limiting the broad availability of transaction data. This proposal with request for comments should help get input from the public to inform this issue. The request for comments, including supporting relevant data, on this rule is intended to inform further review of the proposed amendments, if they were to be issued in final form.

Any comments regarding the collection of information associated with this rule, including suggestions for reducing the burden, may be sent to Jasmeet K. Seehra, OMB, online at *https://www.reginfo.gov/public/do/PRAMain*.

List of Subjects

15 CFR Part 740

Administrative practice and procedure, Exports, Reporting and recordkeeping requirements.

Exports, Reporting and recordkeeping.

For the reasons set forth in the preamble, 15 CFR chapter VII, subchapter C, is proposed to be amended as follows:

PART 740 – [AMENDED]

1. The authority citation for 15 CFR part 740 continues to read as follows:

Authority: 50 U.S.C. 4801-4852; 50 U.S.C. 4601 *et seq.*; 50 U.S.C. 1701 *et seq.*; 22 U.S.C. 7201 *et seq.*; E.O. 13026, 61 FR 58767, 3 CFR, 1996 Comp., p. 228; E.O. 13222, 66 FR 44025, 3 CFR, 2001 Comp., p. 783.

2. Revise paragraph (b) of § 740.20 to read as follows:

§ 740.20 License Exception Strategic Trade Authorization (STA).

* * * * *

(b) *Requirements and limitations*--(1) *Requirements for using License Exception STA*. (i) All of the reasons for control that impose a license requirement under part 742 of the EAR on the export, reexport, or in country transfer must be addressed in at least one authorizing paragraph in paragraph (c) of this section.

(ii) The party using License Exception STA must comply with all of the requirements in paragraph (d) of this section.

(2) *Limitations on use of License Exception STA.* The prohibitions and limits of this paragraph (b)(2) apply notwithstanding the authorizations in paragraph (c) of this section.

(i) License Exception STA may not be used in lieu of any license requirement imposed by part

744 or 746 of the EAR.

(ii) License Exception STA may not be used for:

(A) Any item controlled in ECCNs 0A501.a, .b, .c, .d, or .e; 0A503; 0A981; 0A982; 0A983; 0E504; 0E982; or

(B) Shotguns with barrel length less than 18 inches controlled in 0A502.

(iii) License Exception STA may not be used for any item that is controlled for reason of encryption items (EI), short supply (SS), surreptitious listening (SL), missile technology (MT), or chemical weapons (CW).

(iv) License Exception STA may not be used for any item identified on the CCL as being subject to the exclusive export control jurisdiction of another agency, such as the Department of State, the Department of Energy, or the Nuclear Regulatory Commission.

(v) License Exception STA may not be used for:

(A) Any item controlled by ECCN 1C351.a, .b, .c, .d.11, .d.12 or .e; ECCNs 1C353; 1C354; or ECCN 1E351; or

(B) ECCN 1E001 "technology" for the "development" or "production" of items specified in ECCNs 1A002; 1C001; 1C007.c or .d; 1C008.a.1; 1C009.b; 1C010.b, .c or .d; 1C351.a, .b, .c, .d.11, .d.12 or .e; 1C353; or 1C354.

(vi) Toxins controlled by ECCN 1C351.d.1 through 1C351.d.10 and 1C351.d.13 through 1C351.d.19 are authorized under License Exception STA to destinations indicated in Country

Group A:5 (See Supplement No. 1 to this part), subject to the following limits. For purposes of this paragraph (b)(2)(vi), all such toxins that are sent from one exporter, reexporter, or transferor to a single end-user, on the same day, constitute one shipment.

(A) The maximum amount of any one toxin in any one shipment may not exceed 100 milligrams.

(B) No exporter, reexporter, or transferor may send more than six shipments of any one toxin to any one end user in a single calendar year.

(vii) Commerce Control List Category 7 limitation on use of License Exception STA. License Exception STA may not be used for ECCN 7E004 "technology," except for "technology" controlled under ECCN 7E004.a.7.

(viii) Commerce Control List Category 9 limitations on use of License Exception STA.

(A) License Exception STA may not be used for ECCN 9D001 or 9D002 "software" that is specially designed or modified for the "development" or "production" of:

(*1*) Components of engines controlled by ECCN 9A001 if such components incorporate any of the "technologies" controlled by ECCN 9E003.a.1, 9E003.a.2, 9E003.a.3, 9E003.a.4, 9E003.a.5, 9E003.c, 9E003.i (other than technology for fan or power turbines), 9E003.h; or

(*2*) Equipment controlled by ECCN 9B001.

(B) License Exception STA may not be used for ECCN 9D001 "software" that is specially designed or modified for the "development" of "technology" controlled by ECCN 9E003.a.1, 9E003.a.2, 9E003.a.3, 9E003.a.4, 9E003.a.5, 9E003.c, 9E003.i (other than technology for fan or power turbines) or ECCN 9E003.h. License Exception STA may not be used for ECCN 9D001 "software" that is specially designed or modified for the "development" of "technology" covered by 9E003.a.8 to any of the destinations listed in Country Group A:6.

(C) License Exception STA may not be used for ECCN 9D004.f or 9D004.g "software" to Country Group A:5 or A:6, and may not be used for ECCN 9D004.a or 9D004.c "software" to any of the destinations listed in Country Group A:6 (See Supplement No. 1 to part 740 of the EAR).

(D) License Exception STA may not be used for 9E001 "technology" to any of the destinations listed in Country Group A:6. In addition, License Exception STA may not be used to Country Group A:5 or A:6 for 9E001 "technology" according to the General Technology Note for the "development" of ECCN 9A001.b engines or components of engines controlled by ECCN 9A001.b if such components incorporate:

(*1*) Any of the "technologies" controlled by ECCN 9E003.a.1, 9E003.a.2, 9E003.a.3, 9E003.a.4, 9E003.a.5, 9E003.c, 9E003.i (other than technology for fan or power turbines) or 9E003.h; or

(*2*) Any of the ECCN 9D001 or 9D002 software in paragraph (b)(2)(viii)(A) or (B) of this section.

(E) License Exception STA may not be used for 9E002 "technology" to any of the

destinations in Country Group A:6. In addition, License Exception STA may not be used for Country Group A:5 or A:6 for 9E002 "technology" according to the General Technology Note for the "production" of components of engines controlled by 9A001.b if such components incorporate any of the "technologies" controlled by 9E003.a.1, 9E003.a.2, 9E003.a.3, 9E003.a.4, 9E003.a.5, 9E003.c, 9E003.i (other than technology for fan or power turbines), or 9E003.h.

(F) License Exception STA may not be used for "technology" covered by 9E003.a.1, 9E003.a.2, 9E003.a.3, 9E003.a.4, 9E003.a.5, 9E003.c, 9E003.i (other than technology for fan or power turbines), or 9E003.h. License Exception STA may not be used for "technology" covered by 9E003.a.8 to any of the destinations listed in Country Group A:6.

(ix) License Exception STA may not be used for "technology" according to the General Technology Note for 2E003.f when used for the application of inorganic overlay coatings on gas turbine engine combustors, or turbine blades, vanes or "tip shrouds."

(x) License Exception STA may not be used for items controlled by ECCNs 6A002; 6D002 (software "specially designed" for the "use" of commodities controlled under 6A002.b); 6D003.c; 6D991 (software "specially designed" for the "development," "production," or "use" of commodities controlled under 6A002 or 6A003); 6E001 ("technology" for the "development" of commodities controlled under ECCNs 6A002 or 6A003); or 6E002 "technology" (for the "production" of commodities controlled under ECCNs 6A002 or 6A003).

(xi) License Exception STA may not be used for any commodity controlled by ECCN 3A001.b.2 or .b.3 (except those that are being exported or reexported for use in civil telecommunications applications), or any "technology" controlled by 3E001 for the "production"

or “development” of commodities controlled by 3A001.b.2 or .b.3.

(3) *Limitations on the use of STA that are specific to “600 series” items*. (i) License Exception STA may not be used for any “600 series” items identified in the relevant ECCN as not being eligible for STA.

(ii) License Exception STA may be used to export, reexport, and transfer (in-country) “600 series” items to persons in Country Group A:5, whether non-governmental or governmental, and, for natural persons, if they are nationals of a country listed in Country Group A:5 (See Supplement No. 1 to part 740 of the EAR) or the United States, and if:

(A) The *ultimate* end user for such items is the armed forces, police, paramilitary, law enforcement, customs, correctional, fire, or a search and rescue agency of a government of one of the countries listed in Country Group A:5, or the United States Government;

(B) For the “development,” “production,” operation, installation, maintenance, repair, overhaul, or refurbishing of an item in one of the countries listed in Country Group A:5 or the United States that will be for one, or more, of the following purposes:

(*1*) Ultimately to be used by any such government agencies in one of the countries listed in Country Group A:5 or the United States Government; or

(*2*) Sent to a person in the United States and not for subsequent export under § 740.9(b)(1) (License Exception TMP for items moving in transit through the United States); or

(C) The United States Government has otherwise authorized the ultimate end use, the

license or other authorization is in effect, and the consignee verifies in writing that such authorization exists and has provided the license or other approval identifier to the exporter, reexporter or transferor (as applicable).

(iii) License Exception STA may not be used to export, reexport, or transfer (in-country) end items described in ECCN 0A606.a, ECCN 8A609.a, ECCN 8A620.a or .b, or ECCN 9A610.a until after BIS has approved their export under STA under the procedures set out in paragraph (g) of this section.

(iv) License Exception STA may not be used to export, reexport, or transfer (in-country) "600 series" items if they are "600 Series Major Defense Equipment" and the value of such items in the contract requiring their export exceeds $25,000,000.

Note 1 to paragraphs (b)(2) and (3): Any export, reexport, or transfer (in-country) originally authorized under License Exception STA must stay within the scope of the original authorization. For example, for "600 series" items authorized under License Exception STA, such items must be provided to an eligible ultimate end user, such as a Country Group A:5 military, to stay in compliance with the original authorization. This requirement for the "600 series" is referred to as 'completing the chain,' meaning regardless of how many times the "600 series" item is transferred (in-country) or whether the "600 series" item is incorporated into higher level assemblies or other items, the "600 series" item must ultimately be provided to an eligible ultimate end user, or be otherwise authorized under the EAR. This applies regardless of whether the "600 series" item has been incorporated into a foreign-made item that may no longer be "subject to the EAR." Because the other items eligible for authorization under License Exception STA (9x515 and other non-600 series ECCNs) do not include the "600 series" requirements specific to the ultimate end user, this 'completing the chain' concept does not apply

to 9x515 and other non-600 series ECCNs authorized under License Exception STA. However, the original export, reexport, or transfer (in-country) made under License Exception STA for 9x515 and other non-600 series ECCNs still must comply with the original authorization – meaning the terms and conditions of License Exception STA.

* * * * *

PART 774 – [AMENDED]

3. The authority citation for 15 CFR part 774 continues to read as follows:

Authority: 50 U.S.C. 4801-4852; 50 U.S.C. 4601 et seq.; 50 U.S.C. 1701 et seq.; 10 U.S.C. 8720; 10 U.S.C. 8730(e); 22 U.S.C. 287c, 22 U.S.C. 3201 *et seq.*; 22 U.S.C. 6004; 42 U.S.C. 2139a; 15 U.S.C. 1824; 50 U.S.C. 4305; 22 U.S.C. 7201 *et seq.*; 22 U.S.C. 7210; E.O. 13026, 61 FR 58767, 3 CFR, 1996 Comp., p. 228; E.O. 13222, 66 FR 44025, 3 CFR, 2001 Comp., p. 783.

4. In Supplement No. 1 to part 774, Category 1, Export Control Classification Number (ECCN) 1E001 is revised to read as follows:

SUPPLEMENT NO. 1 TO PART 774 – THE COMMERCE CONTROL LIST

* * * * *

1E001 "Technology" according to the General Technology Note for the "development" or "production" of items controlled by 1A002, 1A003, 1A004, 1A005, 1A006.b, 1A007, 1A008

1A101, 1A231, 1B (except 1B608, 1B613 or 1B999), or 1C (except 1C355, 1C608, 1C980 to 1C984, 1C988, 1C990, 1C991, 1C995 to 1C999).

License Requirements

Reason for Control: NS, MT, NP, CB, RS, AT

Control(s)	*Country Chart (See Supp. No. 1 to part 738)*
NS applies to "technology" for items controlled by 1A002, 1A003, 1A005, 1A006.b, 1A007, 1B001 to 1B003, 1C001 to 1C011	NS Column 1.
NS applies to "technology" for items controlled by 1A004	NS Column 2.
MT applies to "technology" for items controlled by 1A101, 1B001, 1B101, 1B102, 1B115 to 1B119, 1C001, 1C007, 1C011, 1C101, 1C102, 1C107, 1C111, 1C116, 1C117, or 1C118 for MT reasons	MT Column 1.
NP applies to "technology" for items controlled by 1A002, 1A007, 1A231, 1B001, 1B101, 1B201, 1B225, 1B226, 1B228 to 1B234, 1C002, 1C010, 1C111,	NP Column 1.

1C116, 1C202, 1C210, 1C216, 1C225 to 1C237, or 1C239 to 1C241 for NP reasons	
CB applies to "technology" for items controlled by 1C351, 1C353, or 1C354	CB Column 1.
CB applies to "technology" for materials controlled by 1C350 and for chemical detection systems and dedicated detectors therefor, in 1A004.c, that also have the technical characteristics described in 2B351.a	CB Column 2.
RS applies to technology for equipment controlled in 1A004.d	RS Column 2.
AT applies to entire entry	AT Column 1.

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes, except for the following:

1) Items controlled for MT reasons; or

2) Exports and reexports of "technology" for the "development" or production" of the following:

(a) Items controlled by 1A002, 1C001, 1C007.c, 1C008.a.1, 1C009.b, 1C010.b, c, or d

(b) [Reserved]

Special Conditions for STA

STA: See § 740.20(b)(2)(v) of License Exception STA for limitations on availability of STA for items in this entry.

List of Items Controlled

Related Controls (1) Also see ECCNs 1E101, 1E201, and 1E202. (2) See ECCN 1E608 for "technology" for items classified under ECCN 1B608 or 1C608 (note that ECCN 1E001 controls "development" and "production" "technology" for chlorine trifluoride controlled by ECCN 1C111.a.3.f – see ECCN 1E101 for controls on "use" "technology" for chlorine trifluoride). (3) See ECCN 1E002.g for control libraries (parametric technical databases) "specially designed" or modified to enable equipment to perform the functions of equipment controlled under ECCN 1A004.c (Nuclear, biological and chemical (NBC) detection systems) or ECCN 1A004.d (Equipment for detecting or identifying explosives residues). (4) "Technology" for lithium isotope separation (see related ECCN 1B233) and "technology" for items described in ECCN 1C012 are subject to the export licensing authority of the Department of Energy (see 10 CFR part 810). (5) "Technology" for items described in ECCN 1A102 is "subject to the ITAR" (see 22 CFR parts 120 through 130).

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

5. In Supplement No. 1 to part 774, Category 2, ECCN 2E003 is revised to read as follows:

2E003 Other "technology", as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	*Country Chart (See Supp. No. 1 to part 738)*
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: Yes, except 2E003.b, .e and .f

Special Conditions for STA

STA: See § 740.20(b)(2)(ix) of License Exception STA for limitations on availability of STA for items in this entry.

List of Items Controlled

Related Controls: See 2E001, 2E002, and 2E101 for "development" and "use" technology for equipment that are designed or modified for densification of carbon-carbon composites, structural composite rocket nozzles and reentry vehicle nose tips.

Related Definitions: N/A

Items:

a. [Reserved]

b. "Technology" for metal-working manufacturing processes, as follows:

b.1. "Technology" for the design of tools, dies or fixtures "specially designed" for any of the following processes:

b.1.a. "Superplastic forming";

b.1.b. "Diffusion bonding"; *or*

b.1.c. "Direct-acting hydraulic pressing";

b.2. Technical data consisting of process methods or parameters as listed below used to control:

b.2.a. “Superplastic forming” of aluminum alloys, titanium alloys or “superalloys":

b.2.a.1. Surface preparation;

b.2.a.2. Strain rate;

b.2.a.3. Temperature;

b.2.a.4. Pressure;

b.2.b. “Diffusion bonding” of “superalloys” or titanium alloys:

b.2.b.1. Surface preparation;

b.2.b.2. Temperature;

b.2.b.3. Pressure;

b.2.c. ‘Direct-acting hydraulic pressing’ of aluminum alloys or titanium alloys:

b.2.c.1. Pressure;

b.2.c.2. Cycle time;

b.2.d. ‘Hot isostatic densification’ of titanium alloys, aluminum alloys or “superalloys”:

b.2.d.1. Temperature;

b.2.d.2. Pressure;

b.2.d.3. Cycle time;

TECHNICAL NOTES: 1. 'Direct-acting hydraulic pressing' is a deformation process which uses a fluid-filled flexible bladder in direct contact with the workpiece.

2. 'Hot isostatic densification' is a process of pressurizing a casting at temperatures exceeding 375 K (102 °C) in a closed cavity through various media (gas, liquid, solid particles, etc.) to create equal force in all directions to reduce or eliminate internal voids in the casting.

c. “Technology” for the “development” or “production” of hydraulic stretch-forming machines and dies therefor, for the manufacture of airframe structures;

d. [Reserved]

e. “Technology” for the “development” of integration “software” for incorporation of expert systems for advanced decision support of shop floor operations into “numerical control” units;

f. “Technology” for the application of inorganic overlay coatings or inorganic surface modification coatings (specified in column 3 of the following table) to non-electronic substrates (specified in column 2 of the following table), by processes specified in column 1 of the following table and defined in the Technical Note.

N.B. *This table should be read to control the technology of a particular ‘Coating Process’ only when the resultant coating in column 3 is in a paragraph directly across from the relevant ‘Substrate’ under column 2. For example, Chemical Vapor Deposition (CVD) ‘coating process’ control the “technology” for a particular application of ‘silicides’ to ‘Carbon-carbon, Ceramic and Metal “matrix” “composites” substrates, but are not controlled for the application of ‘silicides’ to ‘Cemented tungsten carbide (16), Silicon carbide (18)’ substrates. In the second case, the resultant coating is not listed in the paragraph under column 3 directly across from the paragraph under column 2 listing ‘Cemented tungsten carbide (16), Silicon carbide (18)’.*

Category 2E - Materials Processing Table; Deposition Techniques

1. *Coating Process* (1)[1]	2. *Substrate*	3. *Resultant Coating*

[1] The numbers in parenthesis refer to the Notes following this Table.

1. *Coating Process* (1)[1]	2. *Substrate*	3. *Resultant Coating*
A. Chemical Vapor Deposition (CVD)	"Superalloys"	Aluminides for internal passages
	Ceramics (19) and Low-expansion glasses(14)	Silicides Carbides Dielectric layers (15) Diamond Diamond-like carbon (17)
	Carbon-carbon, Ceramic, and Metal "matrix" "composites"	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Aluminides Alloyed aluminides (2) Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15) Diamond Diamond-like carbon (17)
	Sensor window materials (9)	Dielectric layers (15) Diamond Diamond-like carbon (17)
B. Thermal-Evaporation Physical Vapor		
1. Physical Vapor Deposition (PVD): Deposition (TE-PVD) Electron-Beam (EB-PVD)	"Superalloys"	Alloyed silicides Alloyed aluminides (2) MCrAlX (5) Modified zirconia (12) Silicides Aluminides Mixtures thereof (4)
	Ceramics (19) and Low-expansion glasses (14)	Dielectric layers (15)
	Corrosion resistant steel (7)	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)

1. *Coating Process* (1)[1]	2. *Substrate*	3. *Resultant Coating*
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15) Borides Beryllium
	Sensor window materials (9)	Dielectric layers (15)
	Titanium alloys (13)	Borides Nitrides
2. Ion assisted resistive heating Physical Vapor Deposition (PVD)(Ion Plating)	Ceramics (19) and Low-expansion glasses (14)	Dielectric layers (15) Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Dielectric layers (15)
	Cemented tungsten carbide (16) Silicon carbide	Dielectric layers (15)
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
	Sensor window materials (9)	Dielectric Layers (15) Diamond-like carbon (17)
3. Physical Vapor Deposition (PVD): "Laser" Vaporization	Ceramics (19) and Low-expansion glasses (14)	Silicides Dielectric layers (15) Diamond-like carbon (17)
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Dielectric layers (15)
	Cemented tungsten carbide (16), Silicon carbide	Dielectric Layers (15)

1. *Coating Process* (1)[1]	2. *Substrate*	3. *Resultant Coating*
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Dielectric layers (15)
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon
4. Physical Vapor Deposition (PVD): Cathodic Arc Discharge.	"Superalloys"	Alloyed silicides Alloyed Aluminides (2) MCrA1X (5)
	Polymers (11) and Organic "matrix" "composites"	Borides Carbides Nitrides Diamond-like carbon (17)
C. Pack cementation (see A above for out-of-pack cementation) (10)	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Mixtures thereof (4)
	Titanium alloys (13)	Silicides Aluminides Alloyed aluminides (2)
	Refractory metals and alloys (8)	Silicides Oxides
D. Plasma spraying	"Superalloys"	MCrAlX (5) Modified zirconia (12) Mixtures thereof (4) Abradable Nickel-Graphite Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester Alloyed aluminides (2)
	Aluminum alloys (6)	MCrAlX (5) Modified zirconia (12) Silicides Mixtures thereof (4)
	Refractory metals and alloys (8), Carbides, Corrosion resistant steel (7)	Aluminides Silicides MCrAlX (5) Modified zirconia (12) Mixtures thereof (4)

1. *Coating Process* (1)[1]	2. *Substrate*	3. *Resultant Coating*
D. Plasma spraying (continued)	Titanium alloys (13)	Carbides Aluminides Silicides Alloyed aluminides (2)
	Abradable Nickel Graphite	Abradable materials containing Ni-Cr-Al Abradable Al-Si-Polyester
E. Slurry Deposition	Refractory metals and alloys (8)	Fused silicides Fused aluminides except for resistance heating elements
	Carbon-carbon, Ceramic and Metal "matrix" "composites"	Silicides Carbides Mixtures thereof (4)
F. Sputter Deposition	"Superalloys"	Alloyed silicides Alloyed aluminides (2) Noble metal modified aluminides (3) MCrAlX (5) Modified zirconia (12) Platinum Mixtures thereof (4)
	Ceramics and Low-expansion glasses (14)	Silicides Platinum Mixtures thereof (4) Dielectric layers (15) Diamond-like carbon (17)
	Titanium alloys (13)	Borides Nitrides Oxides Silicides Aluminides Alloyed aluminides (2) Carbides
F. Sputter Deposition (continued)	Carbon-carbon, Ceramic and Metal "matrix" "Composites"	Silicides Carbides Refractory metals Mixtures thereof (4) Dielectric layers (15) Boron nitride

1. *Coating Process* (1)[1]	2. *Substrate*	3. *Resultant Coating*
	Cemented tungsten carbide (16), Silicon carbide (18)	Carbides Tungsten Mixtures thereof (4) Dielectric layers (15) Boron nitride
	Molybdenum and Molybdenum alloys	Dielectric layers (15)
	Beryllium and Beryllium alloys	Borides Dielectric layers (15) Beryllium
	Sensor window materials (9)	Dielectric layers (15) Diamond-like carbon (17)
	Refractory metals and alloys (8)	Aluminides Silicides Oxides Carbides
G. Ion Implantation	High temperature bearing steels	Additions of Chromium, Tantalum, or Niobium (Columbium)
	Titanium alloys (13)	Borides Nitrides
	Beryllium and Beryllium alloys	Borides
	Cemented tungsten carbide (16)	Carbides Nitrides

[1]The numbers in parenthesis refer to the Notes following this Table.

Notes to Table on Deposition Techniques:

1. The term "coating process" includes coating repair and refurbishing as well as original coating.

2. The term "alloyed aluminide coating" includes single or multiple-step coatings in which an element or elements are deposited prior to or during application of the aluminide coating, even if these elements are deposited by another coating process. It does not, however, include the multiple use of single-step pack cementation processes to achieve alloyed aluminides.

3. The term "noble metal modified aluminide" coating includes multiple-step coatings in which the noble metal or noble metals are laid down by some other coating process prior to application of the aluminide coating.

4. The term "mixtures thereof" includes infiltrated material, graded compositions, co-deposits and multilayer deposits and are obtained by one or more of the coating processes specified in the Table.

5. MCrAlX refers to a coating alloy where M equals cobalt, iron, nickel or combinations thereof and X equals hafnium, yttrium, silicon, tantalum in any amount or other intentional additions over 0.01% by weight in various proportions and combinations, except:

a. CoCrAlY coatings which contain less than 22% by weight of chromium, less than 7% by weight of aluminum and less than 2% by weight of yttrium;

b. CoCrAlY coatings which contain 22 to 24% by weight of chromium, 10 to 12% by weight of aluminum and 0.5 to 0.7% by weight of yttrium; or

c. NiCrAlY coatings which contain 21 to 23% by weight of chromium, 10 to 12% by weight of aluminum and 0.9 to 1.1% by weight of yttrium.

6. The term "aluminum alloys" refers to alloys having an ultimate tensile strength of 190 MPa or more measured at 293 K (20 ℃).

7. The term "corrosion resistant steel" refers to AISI (American Iron and Steel Institute) 300 series or equivalent national standard steels.

8. "Refractory metals and alloys" include the following metals and their alloys: niobium (columbium), molybdenum, tungsten and tantalum.

9. "Sensor window materials", as follows: alumina, silicon, germanium, zinc sulfide, zinc selenide, gallium arsenide, diamond, gallium phosphide, sapphire and the following metal halides: sensor window materials of more than 40 mm diameter for zirconium fluoride and hafnium fluoride.

10. Category 2 does not include "technology" for single-step pack cementation of solid airfoils.

11. "Polymers", as follows: polyimide, polyester, polysulfide, polycarbonates and polyurethanes.

12. "Modified zirconia" refers to additions of other metal oxides, (e.g., calcia, magnesia, yttria, hafnia, rare earth oxides) to zirconia in order to stabilize certain crystallographic phases and phase compositions. Thermal barrier coatings made of zirconia, modified with calcia or magnesia by mixing or fusion, are not controlled.

13. "Titanium alloys" refers only to aerospace alloys having an ultimate tensile strength of 900 MPa or more measured at 293 K (20 °C).

14. "Low-expansion glasses" refers to glasses which have a coefficient of thermal expansion of 1 x 10^{-7} K^{-1} or less measured at 293 K (20 °C).

15. "Dielectric layers" are coatings constructed of multi-layers of insulator materials in which the interference properties of a design composed of materials of various refractive indices are used to reflect, transmit or absorb various wavelength bands. Dielectric layers refers to more than four dielectric layers or dielectric/metal "composite" layers.

16. "Cemented tungsten carbide" does not include cutting and forming tool materials consisting of tungsten carbide/(cobalt, nickel), titanium carbide/(cobalt, nickel), chromium carbide/nickel-chromium and chromium carbide/nickel.

17. "Technology" for depositing diamond-like carbon on any of the following is not controlled: magnetic disk drives and heads, equipment for the manufacture of disposables, valves

for faucets, acoustic diaphragms for speakers, engine parts for automobiles, cutting tools, punching-pressing dies, office automation equipment, microphones, medical devices or molds, for casting or molding of plastics, manufactured from alloys containing less than 5% beryllium.

18. "Silicon carbide" does not include cutting and forming tool materials.

19. Ceramic substrates, as used in this entry, does not include ceramic materials containing 5% by weight, or greater, clay or cement content, either as separate constituents or in combination.

Technical Note to Table on Deposition Techniques: *Processes specified in Column 1 of the Table are defined as follows:*

a. Chemical Vapor Deposition (CVD) is an overlay coating or surface modification coating process wherein a metal, alloy, "composite", dielectric or ceramic is deposited upon a heated substrate. Gaseous reactants are decomposed or combined in the vicinity of a substrate resulting in the deposition of the desired elemental, alloy or compound material on the substrate. Energy for this decomposition or chemical reaction process may be provided by the heat of the substrate, a glow discharge plasma, or "laser" irradiation.

Note 1: *CVD includes the following processes: directed gas flow out-of-pack deposition, pulsating CVD, controlled nucleation thermal decomposition (CNTD), plasma enhanced or plasma assisted CVD processes.*

Note 2: *Pack denotes a substrate immersed in a powder mixture.*

Note 3: *The gaseous reactants used in the out-of-pack process are produced using the same basic reactions and parameters as the pack cementation process, except that the substrate to be coated is not in contact with the powder mixture.*

b. Thermal Evaporation-Physical Vapor Deposition (TE-PVD) is an overlay coating process conducted in a vacuum with a pressure less than 0.1 Pa wherein a source of thermal energy is used to vaporize the coating material. This process results in the condensation, or deposition, of the evaporated species onto appropriately positioned substrates. The addition of gases to the vacuum chamber during the coating process to synthesize compound coatings is an ordinary modification of the process. The use of ion or electron beams, or plasma, to activate or assist the coating's deposition is also a common modification in this technique. The use of monitors to provide in-process measurement of optical characteristics and thickness of coatings can be a feature of these processes. Specific TE-PVD processes are as follows:

1. Electron Beam PVD uses an electron beam to heat and evaporate the material which forms the coating;

2. Ion Assisted Resistive Heating PVD employs electrically resistive heating sources in combination with impinging ion beam(s) to produce a controlled and uniform flux of evaporated coating species;

3. "Laser" Vaporization uses either pulsed or continuous wave "laser" beams to vaporize the material which forms the coating;

4. Cathodic Arc Deposition employs a consumable cathode of the material which forms the coating and has an arc discharge established on the surface by a momentary contact of a ground trigger. Controlled motion of arcing erodes the cathode surface creating a highly ionized plasma. The anode can be either a cone attached to the periphery of the cathode, through an insulator, or the chamber. Substrate biasing is used for non line-of-sight deposition.

Note: *This definition does not include random cathodic arc deposition with non-biased substrates.*

5. Ion Plating is a special modification of a general TE-PVD process in which a plasma or an ion source is used to ionize the species to be deposited, and a negative bias is applied to the substrate in order to facilitate the extraction of the species from the plasma. The introduction of reactive species, evaporation of solids within the process chamber, and the use of monitors to provide in-process measurement of optical characteristics and thicknesses of coatings are ordinary modifications of the process.

c. Pack Cementation is a surface modification coating or overlay coating process wherein a substrate is immersed in a powder mixture (a pack), that consists of:

1. The metallic powders that are to be deposited (usually aluminum, chromium, silicon or combinations thereof);

2. An activator (normally a halide salt); and

3. An inert powder, most frequently alumina.

Note: *The substrate and powder mixture is contained within a retort which is heated to between 1,030 K (757 °C) to 1,375 K (1,102 °C) for sufficient time to deposit the coating.*

d. Plasma Spraying is an overlay coating process wherein a gun (spray torch) which produces and controls a plasma accepts powder or wire coating materials, melts them and propels them towards a substrate, whereon an integrally bonded coating is formed. Plasma spraying constitutes either low pressure plasma spraying or high velocity plasma spraying.

Note 1: *Low pressure means less than ambient atmospheric pressure.*

Note 2: *High velocity refers to nozzle-exit gas velocity exceeding 750 m/s calculated at 293 K (20° C) at 0.1 MPa.*

e. Slurry Deposition is a surface modification coating or overlay coating process wherein a metallic or ceramic powder with an organic binder is suspended in a liquid and is applied to a

substrate by either spraying, dipping or painting, subsequent air or oven drying, and heat treatment to obtain the desired coating.

f. Sputter Deposition is an overlay coating process based on a momentum transfer phenomenon, wherein positive ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on an appropriately positioned substrate.

Note 1: *The Table refers only to triode, magnetron or reactive sputter deposition which is used to increase adhesion of the coating and rate of deposition and to radio frequency (RF) augmented sputter deposition used to permit vaporization of non-metallic coating materials.*

Note 2: *Low-energy ion beams (less than 5 keV) can be used to activate the deposition.*

g. Ion Implantation is a surface modification coating process in which the element to be alloyed is ionized, accelerated through a potential gradient and implanted into the surface region of the substrate. This includes processes in which ion implantation is performed simultaneously with electron beam physical vapor deposition or sputter deposition.

Accompanying Technical Information to Table on Deposition Techniques:

1. Technical information for pretreatments of the substrates listed in the Table, as follows:

a. Chemical stripping and cleaning bath cycle parameters, as follows:

1. Bath composition;

a. For the removal of old or defective coatings corrosion product or foreign deposits;

b. For preparation of virgin substrates;

2. Time in bath;

3. Temperature of bath;

4. Number and sequences of wash cycles;

b. Visual and macroscopic criteria for acceptance of the cleaned part;

c. Heat treatment cycle parameters, as follows:

1. Atmosphere parameters, as follows:

a. Composition of the atmosphere;

b. Pressure of the atmosphere;

2. Temperature for heat treatment;

3. Time of heat treatment;

d. Substrate surface preparation parameters, as follows:

1. Grit blasting parameters, as follows:

a. Grit composition;

b. Grit size and shape;

c. Grit velocity;

2. Time and sequence of cleaning cycle after grit blast;

3. Surface finish parameters;

4. Application of binders to promote adhesion;

e. Masking technique parameters, as follows:

1. Material of mask;

2. Location of mask;

2. Technical information for in situ quality assurance techniques for evaluation of the coating processes listed in the Table, as follows:

a. Atmosphere parameters, as follows:

1. Composition of the atmosphere;

2. Pressure of the atmosphere;

b. Time parameters;

c. Temperature parameters;

d. Thickness parameters;

e. Index of refraction parameters;

f. Control of composition;

3. Technical information for post deposition treatments of the coated substrates listed in the Table, as follows:

a. Shot peening parameters, as follows:

1. Shot composition;

2. Shot size;

3. Shot velocity;

b. Post shot peening cleaning parameters;

c. Heat treatment cycle parameters, as follows:

1. Atmosphere parameters, as follows:

a. Composition of the atmosphere;

b. Pressure of the atmosphere;

2. Time-temperature cycles;

d. Post heat treatment visual and macroscopic criteria for acceptance of the coated substrates;

4. Technical information for quality assurance techniques for the evaluation of the coated substrates listed in the Table, as follows:

a. Statistical sampling criteria;

b. Microscopic criteria for:

1. Magnification;

2. *Coating thickness, uniformity;*

3. *Coating integrity;*

4. *Coating composition;*

5. *Coating and substrates bonding;*

6. *Microstructural uniformity.*

c. Criteria for optical properties assessment (measured as a function of wavelength):

1. *Reflectance;*

2. *Transmission;*

3. *Absorption;*

4. *Scatter;*

5. Technical information and parameters related to specific coating and surface modification processes listed in the Table, as follows:

a. For Chemical Vapor Deposition (CVD):

1. Coating source composition and formulation;

2. Carrier gas composition;

3. Substrate temperature;

4. Time-temperature-pressure cycles;

5. Gas control and part manipulation;

b. For Thermal Evaporation-Physical Vapor Deposition (PVD):

1. Ingot or coating material source composition;

2. Substrate temperature;

3. Reactive gas composition;

4. Ingot feed rate or material vaporization rate;

5. Time-temperature-pressure cycles;

6. Beam and part manipulation;

7. "Laser" parameters, as follows:

a. Wave length;

b. Power density;

c. Pulse length;

d. Repetition ratio;

e. Source;

c. For Pack Cementation:

1. *Pack composition and formulation;*

2. *Carrier gas composition;*

3. *Time-temperature-pressure cycles;*

d. For Plasma Spraying:

1. *Powder composition, preparation and size distributions;*

2. *Feed gas composition and parameters;*

3. *Substrate temperature;*

4. *Gun power parameters;*

5. *Spray distance;*

6. *Spray angle;*

7. *Cover gas composition, pressure and flow rates;*

8. *Gun control and part manipulation;*

e. *For Sputter Deposition:*

1. *Target composition and fabrication;*

2. *Geometrical positioning of part and target;*

3. *Reactive gas composition;*

4. *Electrical bias;*

5. *Time-temperature-pressure cycles;*

6. *Triode power;*

7. *Part manipulation;*

f. For Ion Implantation:

1. *Beam control and part manipulation;*

2. *Ion source design details;*

3. *Control techniques for ion beam and deposition rate parameters;*

4. *Time-temperature-pressure cycles.*

g. For Ion Plating:

1. *Beam control and part manipulation;*

2. *Ion source design details;*

3. *Control techniques for ion beam and deposition rate parameters;*

4. *Time-temperature-pressure cycles;*

5. *Coating material feed rate and vaporization rate;*

6. *Substrate temperature;*

7. *Substrate bias parameters.*

6. In Supplement No. 1 to part 774, Category 9, ECCN 9D001 is revised to read as follows:

9D001 "Software", not specified in 9D003 or 9D004, "specially designed" or modified for the "development" of equipment or "technology" controlled by ECCN 9A001 to 9A004, 9A012, 9A101 (except for items in 9A101.b that are "subject to the ITAR," see 22 CFR part 121), 9A106.d. or .e, 9A110, or 9A120, 9B (except for ECCNs 9B604, 9B610, 9B619, 9B990, and 9B991), or ECCN 9E003.

License Requirements

Reason for Control: NS, MT, AT

Control(s)	*Country Chart*

	(See Supp. No. 1 to part 738)
NS applies to "software" for equipment controlled by 9A001 to 9A004, 9A012, 9B001 to 9B010, and technology controlled by 9E003.	NS Column 1
MT applies to "software" for equipment controlled by 9B116 for MT reasons.	MT Column 1
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A .

Special Conditions for STA

STA: See § 740.20(b)(2)(viii) of License Exception STA for limitations on availability of STA for Commerce Control List Category 9 items in this entry.

List of Items Controlled

Related Controls "Software" that is "required" for the "development" of items specified in ECCNs 9A005 to 9A011, 9A101.b (except for items that are subject to the EAR), 9A103 to 9A105, 9A106.a, .b, and .c, 9A107 to 9A109, 9A110 (for items that are "specially designed" for use in missile systems and subsystems), and 9A111 to 9A119 is "subject to the ITAR."

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

7. In Supplement No. 1 to part 774, Category 9, ECCN 9D002 is revised to read as follows:

9D002 "Software", not specified in 9D003 or 9D004, "specially designed" or modified for the "production" of equipment controlled by ECCN 9A001 to 9A004, 9A012, 9A101 (except for items in 9A101.b that are "subject to the ITAR," see 22 CFR part 121), 9A106.d or .e, 9A110, or 9A120, 9B (except for ECCNs 9B604, 9B610, 9B619, 9B990, and 9B991).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	*Country Chart (See Supp. No. 1 to part 738)*
NS applies to "software" for equipment controlled by 9A001 to 9A004, 9A012, 9B001 to 9B010.	NS Column 1
MT applies to "software" for equipment controlled by 9B116 for MT reasons.	MT Column 1
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A.

Special Conditions for STA

STA: See § 740.20(b)(2)(viii) of License Exception STA for limitations on availability of STA for Commerce Control List Category 9 items in this entry.

List of Items Controlled

Related Controls: "Software" that is "required" for the "production" of items specified in ECCNs 9A005 to 9A011, 9A101.b (except for items that are subject to the EAR), 9A103 to 9A105, 9A106.a, .b, and .c, 9A107 to 9A109, 9A110 (for items that are "specially designed" for use in missile systems and subsystems), and 9A111 to 9A119 is "subject to the ITAR."

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

8. In Supplement No. 1 to part 774, Category 9, ECCN 9D004 is revised to read as follows:

9D004 Other "software" as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, AT

Control(s)	*Country Chart (See Supp. No. 1 to part 738)*
NS applies to entire entry	NS Column 1
AT applies to entire entry	AT Column 1

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A.

Special Conditions for STA

STA: See § 740.20(b)(2)(viii) of License Exception STA for limitations on availability of STA for Commerce Control List Category 9 items in this entry.

List of Items Controlled

Related Controls: See also 9D104.

Related Definitions: N/A

Items:

a. 2D or 3D viscous "software", validated with wind tunnel or flight test data required for detailed engine flow modelling;

b. "Software" for testing aero gas turbine engines, assemblies, "parts" or "components", having all of the following:

b.1. "Specially designed" for testing any of the following:

b.1.a. Aero gas turbine engines, assemblies or components, incorporating "technology" specified by 9E003.a, 9E003.h or 9E003.i; *or*

b.1.b. Multi-stage compressors providing either bypass or core flow, specially designed for aero gas turbine engines incorporating "technology" specified by 9E003.a or 9E003.h; *and*

b.2. "Specially designed" for all of the following:

b.2.a. Acquisition and processing of data, in real time; *and*

b.2.b. Feedback control of the test article or test conditions (*e.g.,* temperature, pressure, flow rate) while the test is in progress;

Note: *9D004.b does not specify software for operation of the test facility or operator safety (e.g., overspeed shutdown, fire detection and suppression), or production, repair or maintenance acceptance-testing limited to determining if the item has been properly assembled or repaired.*

c. "Software" "specially designed" to control directional solidification or single crystal material growth in equipment specified by 9B001.a or 9B001.c;

d. [RESERVED]

e. "Software" "specially designed" or modified for the operation of items specified by 9A012;

f. "Software" "specially designed" to design the internal cooling passages of aero gas turbine engine blades, vanes and "tip shrouds";

g. "Software" having all of the following:

g.1. "Specially designed" to predict aero thermal, aeromechanical and combustion conditions in aero gas turbine engines; *and*

g.2. Theoretical modeling predictions of the aero thermal, aeromechanical and combustion conditions, which have been validated with actual turbine engine (experimental or production) performance data.

9. In supplement No. 1 to part 774, Category 9, ECCN 9E001 is revised to read as follows:

9E001 "Technology" according to the General Technology Note for the "development" of equipment or "software", controlled by 9A001.b, 9A004, 9A012, 9B (except for ECCNs 9B604, 9B610, 9B619, 9B990 and 9B991), or ECCN 9D001 to 9D004, 9D101, or 9D104.

License Requirements

Reason for Control: NS, MT, AT

Control(s)	*Country Chart*

	(See Supp. No. 1 to part 738)
NS applies to "technology" for items controlled by 9A001.b, 9A004, 9A012, 9B001 to 9B010, 9D001 to 9D004 for NS reasons.	NS Column 1
MT applies to "technology" for items controlled by 9A012, 9B001, 9B002, 9B003, 9B004, 9B005, 9B007, 9B104, 9B105, 9B106, 9B115, 9B116, 9B117, 9D001, 9D002, 9D003, or 9D004 for MT reasons.	MT Column 1
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

Special Conditions for STA

STA: See § 740.20(b)(2)(viii) of License Exception STA for limitations on availability of STA for Commerce Control List Category 9 items in this entry.

List of Items Controlled

Related Controls: (1) See also 9E101 and 1E002.f (for controls on "technology" for the repair of controlled structures, laminates or materials). (2) "Technology" required for the "development" of equipment described in ECCNs 9A005 to 9A011 or "software" described in ECCNs 9D103 and 9D105 is "subject to the ITAR."

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

10. In supplement No. 1 to part 774, Category 9, ECCN 9E002 is revised to read as follows:

9E002 ‘‘Technology’’ according to the General Technology Note for the ‘‘production’’ of ‘‘equipment’’ controlled by ECCN 9A001.b, 9A004 or 9B (except for ECCNs 9B117, 9B604, 9B610, 9B619, 9B990, and 9B991).

License Requirements

Reason for Control: NS, MT, AT

Control(s)	*Country Chart (See Supp. No. 1 to part 738)*
NS applies to entire entry	NS Column 1
MT applies to “technology” for equipment controlled by 9B001, 9B002, 9B003, 9B004, 9B005, 9B007, 9B104, 9B105, 9B106,	MT Column 1

9B115 or 9B116 for MT reasons.	
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

Special Conditions for STA

STA: See § 740.20(b)(2)(viii) of License Exception STA for limitations on availability of STA for Commerce Control List Category 9 items in this entry.

List of Items Controlled

Related Controls: (1) See also 9E102. (2) See also 1E002.f for "technology" for the repair of controlled structures, laminates or materials. (3) "Technology" that is required for the "production" of equipment described in ECCNs 9A005 to 9A011 is "subject to the ITAR."

Related Definitions: N/A

Items:

The list of items controlled is contained in the ECCN heading.

11. In supplement No. 1 to part 774, Category 9, ECCN 9E003 is revised to read as follows:

9E003 Other "technology" as follows (see List of Items Controlled).

License Requirements

Reason for Control: NS, SI, AT

Control(s)	*Country Chart (See Supp. No. 1 to part 738)*
NS applies to entire entry	NS Column 1

SI applies to 9E003.a.1 through a.8,.h, .i, and .k.	See §742.14 of the EAR for additional information.
AT applies to entire entry	AT Column 1

Reporting Requirements

See § 743.1 of the EAR for reporting requirements for exports under License Exceptions, and Validated End-User authorizations.

List Based License Exceptions (See Part 740 for a description of all license exceptions)

TSR: N/A

Special Conditions for STA

STA: See § 740.20(b)(2)(viii) of License Exception STA for limitations on availability of STA for Commerce Control List Category 9 items in this entry.

List of Items Controlled

Related Controls: (1) Hot section "technology" specifically designed, modified, or equipped for military uses or purposes, or developed principally with U.S. Department of Defense funding, is "subject to the ITAR" (see 22 CFR parts 120 through 130). (2) "Technology" is subject to the EAR when actually applied to a commercial "aircraft" engine program. Exporters may seek to establish commercial application either on a case-by-case basis through submission of documentation demonstrating application to a commercial program in requesting an export license from the Department Commerce in respect to a specific export, or in the case of use for broad categories of "aircraft," engines, "parts" or "components," a commodity jurisdiction determination from the Department of State.

Related Definitions: N/A

Items:

a. "Technology" "required" for the "development" or "production" of any of the following gas turbine engine "parts," "components" or systems:

a.1. Gas turbine blades, vanes or "tip shrouds", made from directionally solidified (DS) or single crystal (SC) alloys and having (in the 001 Miller Index Direction) a stress-rupture life exceeding 400 hours at 1,273 K (1,000°C) at a stress of 200 MPa, based on the average property values;

***Technical Note**: For the purposes of 9E003.a.1, stress-rupture life testing is typically conducted on a test specimen.*

a.2. Combustors having any of the following:

a.2.a. ‘Thermally decoupled liners’ designed to operate at ‘combustor exit temperature’ exceeding 1,883K (1,610° C);

a.2.b. Non-metallic liners;

a.2.c. Non-metallic shells; *or*

a.2.d. Liners designed to operate at 'combustor exit temperature' exceeding 1,883K (1,610°C) and having holes that meet the parameters specified by 9E003.c;

***Note**: The “required” “technology” for holes in 9E003.a.2 is limited to the derivation of the geometry and location of the holes.*

Technical Notes:

1. ‘Thermally decoupled liners’ are liners that feature at least a support structure designed to carry mechanical loads and a combustion facing structure designed to protect the support structure from the heat of combustion. The combustion facing structure and support structure

have independent thermal displacement (mechanical displacement due to thermal load) with respect to one another, i.e. they are thermally decoupled.

2. 'Combustor exit temperature' is the bulk average gas path total (stagnation) temperature between the combustor exit plane and the leading edge of the turbine inlet guide vane (i.e., measured at engine station T40 as defined in SAE ARP 755A) when the engine is running in a "steady state mode" of operation at the certificated maximum continuous operating temperature.

***N.B.**: See 9E003.c for "technology" "required" for manufacturing cooling holes.*

a.3. "Parts" or "components," that are any of the following:

a.3.a. Manufactured from organic "composite" materials designed to operate above 588 K (315 °C);

a.3.b. Manufactured from any of the following:

a.3.b.1. Metal "matrix" "composites" reinforced by any of the following:

a.3.b.1.a. Materials controlled by 1C007;

a.3.b.1.b. “Fibrous or filamentary materials” specified by 1C010; *or*

a.3.b.1.c. Aluminides specified by 1C002.a; *or*

a.3.b.2. Ceramic “matrix” “composites” specified by 1C007; *or*

a.3.c. Stators, vanes, blades, tip seals (shrouds), rotating blings, rotating blisks or ‘splitter ducts’, that are all of the following:

a.3.c.1. Not specified in 9E003.a.3.a;

a.3.c.2. Designed for compressors or fans; *and*

a.3.c.3. Manufactured from material controlled by 1C010.e with resins controlled by 1C008;

Technical Note*: A ‘splitter duct’ performs the initial separation of the air-mass flow between the bypass and core sections of the engine.*

a.4. Uncooled turbine blades, vanes or “tip shrouds” designed to operate at a ‘gas path temperature’ of 1,373 K (1,100 °C) or more;

a.5. Cooled turbine blades, vanes or “tip-shrouds”, other than those described in 9E003.a.1, designed to operate at a ‘gas path temperature’ of 1,693 K (1,420°C) or more;

Technical Note*: ‘Gas path temperature’ is the bulk average gas path total (stagnation) temperature at the leading edge plane of the turbine component when the engine is running in a “steady state mode” of operation at the certificated or specified maximum continuous operating temperature.*

a.6. Airfoil-to-disk blade combinations using solid state joining;

a.7. [Reserved];

a.8. ‘Damage tolerant’ gas turbine engine rotor “parts” or “components” using powder metallurgy materials controlled by 1C002.b;*or*

Technical Note*: ‘Damage tolerant’ “parts” and “components” are designed using methodology and substantiation to predict and limit crack growth.*

a.9. [Reserved]

N.B.: *For “FADEC systems”, see 9E003.h.*

a.10. [Reserved]

***N.B.**: For adjustable flow path geometry, see 9E003.i.*

a.11. ‘Fan blades’ having all of the following:

a.11.a. 20% or more of the total volume being one or more closed cavities containing vacuum or gas only; and

a.11.b. One or more closed cavities having a volume of 5 cm^3 or larger;

Technical Note: For the purposes of 9E003.a.11, a ‘fan blade’ is the aerofoil portion of the rotating stage or stages, which provide both compressor and bypass flow in a gas turbine engine.

b. “Technology” “required” for the “development” or “production” of any of the following:

b.1. Wind tunnel aero-models equipped with non-intrusive sensors capable of transmitting data from the sensors to the data acquisition system; *or*

b.2. “Composite” propeller blades or prop-fans, capable of absorbing more than 2,000 kW at flight speeds exceeding Mach 0.55;

c. “Technology” “required” for manufacturing cooling holes, in gas turbine engine “parts” or “components” incorporating any of the “technologies” specified by 9E003.a.1, 9E003.a.2 or 9E003.a.5, and having any of the following:

c.1. Having all of the following:

c.1.a. Minimum ‘cross-sectional area’ less than 0.45 mm^2;

c.1.b. ‘Hole shape ratio’ greater than 4.52; *and*

c.1.c. ‘Incidence angle’ equal to or less than 25°; *or*

c.2. Having all of the following:

c.2.a. Minimum ‘cross-sectional area’ less than 0.12 mm^2;

c.2.b. ‘Hole shape ratio’ greater than 5.65; *and*

c.2.c. ‘Incidence angle’ more than 25°;

***Note**: 9E003.c does not apply to “technology” for manufacturing constant radius cylindrical holes that are straight through and enter and exit on the external surfaces of the component.*

***Technical Notes**:*

1. For the purposes of 9E003.c, the 'cross-sectional area' is the area of the hole in the plane perpendicular to the hole axis.

2. For the purposes of 9E003.c, 'hole shape ratio' is the nominal length of the axis of the hole divided by the square root of its minimum 'cross-sectional area'.

3. For the purposes of 9E003.c, 'incidence angle' is the acute angle measured between the plane tangential to the airfoil surface and the hole axis at the point where the hole axis enters the airfoil surface.

4. Techniques for manufacturing holes in 9E003.c include "laser" beam machining, water jet machining, Electro-Chemical Machining (ECM).

d. "Technology" "required" for the "development" or "production" of helicopter power transfer systems or tilt rotor or tilt wing "aircraft" power transfer systems;

e. "Technology" for the "development" or "production" of reciprocating diesel engine ground vehicle propulsion systems having all of the following:

e.1. 'Box volume' of 1.2 m^3 or less;

e.2. An overall power output of more than 750 kW based on 80/1269/EEC, ISO 2534 or national equivalents; *and*

e.3. Power density of more than 700 kW/m^3 of 'box volume';

Technical Note: *'Box volume' is the product of three perpendicular dimensions measured in the following way:*

Length: The length of the crankshaft from front flange to flywheel face;

Width: The widest of any of the following:

a. The outside dimension from valve cover to valve cover;

b. The dimensions of the outside edges of the cylinder heads; or

c. The diameter of the flywheel housing;

Height: The largest of any of the following:

a. The dimension of the crankshaft center-line to the top plane of the valve cover (or cylinder head) plus twice the stroke; or

b. The diameter of the flywheel housing.

f. “Technology” “required” for the “production” of “specially designed” “parts” or “components” for high output diesel engines, , as follows:

f.1. “Technology” “required” for the “production” of engine systems having all of the following “parts” and “components” employing ceramics materials controlled by 1C007:

f.1.a Cylinder liners;

f.1.b. Pistons;

f.1.c. Cylinder heads; *and*

f.1.d. One or more other “part” or “component” (including exhaust ports, turbochargers, valve guides, valve assemblies or insulated fuel injectors);

f.2. “Technology” “required” for the “production” of turbocharger systems with single-stage compressors and having all of the following:

f.2.a. Operating at pressure ratios of 4:1 or higher;

f.2.b. Mass flow in the range from 30 to 130 kg per minute; *and*

f.2.c. Variable flow area capability within the compressor or turbine sections;

f.3. “Technology” “required” for the “production” of fuel injection systems with a “specially designed” multifuel (e.g., diesel or jet fuel) capability covering a viscosity range from diesel fuel (2.5 cSt at 310.8 K (37.8°C)) down to gasoline fuel (0.5 cSt at 310.8 K (37.8°C)) and having all of the following:

f.3.a. Injection amount in excess of 230 mm^3 per injection per cylinder; *and*

f.3.b. Electronic control features “specially designed” for switching governor characteristics automatically depending on fuel property to provide the same torque characteristics by using the appropriate sensors;

g. “Technology” “required” for the development” or “production” of ‘high output diesel engines’ for solid, gas phase or liquid film (or combinations thereof) cylinder wall lubrication and permitting operation to temperatures exceeding 723 K (450°C), measured on the cylinder wall at the top limit of travel of the top ring of the piston;

Technical Note*: ‘High output diesel engines’ are diesel engines with a specified brake mean effective pressure of 1.8 MPa or more at a speed of 2,300 rpm, provided the rated speed is 2,300 rpm or more.*

h. “Technology” for gas turbine engine “FADEC systems” as follows:

h.1. “Development” “technology” for deriving the functional requirements for the “parts” or “components” necessary for the “FADEC system” to regulate engine thrust or shaft power (e.g., feedback sensor time constants and accuracies, fuel valve slew rate);

h.2. “Development” or “production” “technology” for control and diagnostic “parts” or “components” unique to the “FADEC system” and used to regulate engine thrust or shaft power;

h.3. “Development” “technology” for the control law algorithms, including “source code”, unique to the “FADEC system” and used to regulate engine thrust or shaft power;

Note*: 9E003.h does not apply to technical data related to engine-“aircraft” integration required by civil aviation authorities of one or more Wassenaar Arrangement Participating States*

(see Supplement No. 1 to part 743 of the EAR) to be published for general airline use (e.g., installation manuals, operating instructions, instructions for continued airworthiness) or interface functions (e.g., input/output processing, airframe thrust or shaft power demand).

i. "Technology" for adjustable flow path systems designed to maintain engine stability for gas generator turbines, fan or power turbines, or propelling nozzles, as follows:

i.1. "Development" "technology" for deriving the functional requirements for the "parts" or "components" that maintain engine stability;

i.2. "Development" or "production" "technology" for "parts" or "components" unique to the adjustable flow path system and that maintain engine stability;

i.3. "Development" "technology" for the control law algorithms, including "source code", unique to the adjustable flow path system and that maintain engine stability;

Note: *9E003.i does not apply to "technology" for any of the following:*

a. Inlet guide vanes;

b. Variable pitch fans or prop-fans;

c. Variable compressor vanes;

d. Compressor bleed valves; or

e. Adjustable flow path geometry for reverse thrust.

j. “Technology” “required” for the “development” of wing-folding systems designed for fixed-wing “aircraft” powered by gas turbine engines.

N.B.: *For “technology” “required” for the “development” of wing-folding systems designed for fixed-wing “aircraft” specified in USML Category VIII(a), see USML Category VIII(i).*

k. “Technology” not otherwise controlled in 9E003.a.1 through a.8, a.10, and .h and used in the “development”, “production”, or overhaul of hot section “parts” or “components” of civil derivatives of military engines controlled on the USML.

Matthew S. Borman,

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